Simulation Data of Cold Front-Related Hydrodynamics of Wax Lake Delta, LA

Qian Zhang\textsuperscript{1,3}, Chunyan Li\textsuperscript{2}, Heidi Imker\textsuperscript{3}, Bertram Ludäscher\textsuperscript{1}, and Megan Senseney\textsuperscript{1}

\textsuperscript{1}Graduate School of Library and Information Science (GSLIS), University of Illinois at Urbana Champaign (UIUC)

\textsuperscript{2}Department of Oceanography and Coastal Sciences (DOCS), School of the Coast and Environment, Louisiana State University (LSU)

\textsuperscript{3}University Library, University of Illinois at Urbana-Champaign (UIUC)

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INTRODUCTION

Why this delta is so special?
• Growing: rare example
• Healthy: self-maintaining & stable
• Important: economy, ecosystem, & residence

Poor understanding of delta hydrodynamics
  ❖ Lack of data
  ❖ No high-resolution model

→ Objective: To determine the circulation and wind-driven flows of this delta during winter cold fronts using modeling
→ Challenge: extensive wetland and inundation!

Wax Lake Delta ("the Delta")
DATA SOURCES

Meteorological Data
- winds (speed and direction)
- sea level air pressure
- air temperature

Oceanography Data
- water levels
- currents (velocity and direction)

Topography & Bathymetry Data: 5 sources
- NGDC 3 arc-second (~90 meters) U.S. Coastal Relief Model (CRM)
- LIDAR data: Light Detection and Ranging
- 3 field surveys led by Dr. Li

River Discharge
- USGS station 07381590 (the Wax Lake Outlet at Calumet, LA)
- USGS station 07381600 (the Lower Atchafalaya River at Morgan City, LA)
DATA WORK

Meteorological Data
- winds (speed and direction)

Topography & Bathymetry Data: 5 sources
- NGDC 3 arc-second (~90 meters) U.S. Coastal Relief Model (CRM)
- LIDAR data: Light Detection and Ranging
- 3 field surveys led by Dr. Li
  - air temperature
  - sea level
  - air pressure
  - water levels

Currents (velocity and direction)

River Discharge
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Oceanography Data
METHODOLOGY

**Input (~55GB)**
- Mesh grids
- Bathymetry
- Wind
- Tides
- River discharge

**Numerical model: ECOM-si**

**Output (~12GB)**
- Water Levels
- Currents
- Water flux

**Visualization**
- Data analysis
- Visualization type: .tif, .png, .gif, .fig, .jpg, .bmp, .mp4

**Input data type:** .xlsx, .csv, .txt, .nc, .dat, .kml, .kmz, .nml, .run, .2dm, .img, .grd, .cuv, .spl, .pol, .ldb

**Output data type:** .out, .txt, .dat, Unix executable
Cold-front induced flushing in WLD

Energy distribution and dominant forcing

Flow partition:

A + B + C + D + E + F = 25% TOTAL FLUX!

Amplitude spectral of water level:

T of water

Subtidal

Tidal

Diurnal

Midiurnal

Nor diurnal

2

5, 1
How to make a VALUABLE dataset?
SIMULATION CASES
DATA SHARING AND REUSE

“You are standing on the shoulders of giants”...

- Enhance understanding, especially for (re-)discovery across domains:
  - list = [Atmosphere and climatology, geomorphology, wetland biogeochemistry, coastal hazard prediction and mitigation, coastal ecosystems, ...]

- What can be reused:
  - dict = {data: dataset, code: [data analysis scripts, numerical model], methodology}
RESEARCH REPRODUCIBILITIY

• Challenges:
  • Understanding and awareness
  • Standards
  • Incentives
  • Infrastructure
  • License for dataset and code

• A new question is then raised:
  • If some of the input data cannot be shared, does that mean the output data shouldn’t be shared either?
  • How similar is it to non-consumptive research???
Thank you! 😊